

SPS Fabrication of Nuclear CERMET Fuel Materials using W Powder Coated UO₂ Feedstocks

Completed Technology Project (2015 - 2016)



Project Introduction

To overcome the NTP propellant feedstock challenges, MSFC developed a new powder coating technique that uses a polymer binder to coat UO₂ particles with W prior to fuel element fabrication. This current effort will involve evaluation of the new powder coated feedstock material and Spark Plasma Sintering (SPS) as an innovative method of fabricating cermet fuel for NTP applications. This effort will include (1) assessment of the viability of the powder coated UO₂ feedstock, and (2) evaluation of the SPS system as a suitable method to produce fuel material with the appropriate material properties. The end goal is a characterized W/UO₂ fuel wafer that can potentially be further processed to produce a sub-scale prototypic fuel element.

Anticipated Benefits

Develop and fabricate a stable high- temperature nuclear fuel element, which is a critical technology for Nuclear Thermal Propulsion (NTP). NTP systems have great potential to enable future human Mars missions by providing faster trip times than conventional propulsion systems.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
★ Marshall Space Flight Center (MSFC)	Lead Organization	NASA Center	Huntsville, Alabama
Aerojet Rocketdyne Holdings, Inc.	Supporting Organization	Industry	El Segundo, California
● Exploration Capabilities	Supporting Organization	NASA Program	

Primary U.S. Work Locations

Alabama

Project Website:

<https://www.nasa.gov/directorates/spacetech/home/index.html>

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Marshall Space Flight Center (MSFC)

Responsible Program:

Center Innovation Fund: MSFC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

John W Dankanich

Principal Investigator:

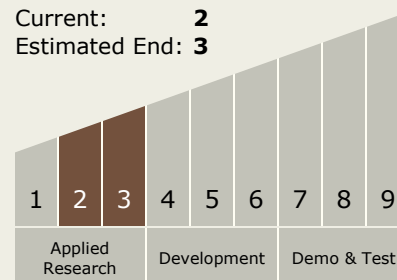
Marvin W Barnes

Technology Maturity (TRL)

Start: 2

Current: 2

Estimated End: 3



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Technology Areas

Primary:

- TX03 Aerospace Power and Energy Storage
 - └ TX03.1 Power Generation and Energy Conversion
 - └ TX03.1.4 Dynamic Energy Conversion